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**Microprocessor-Controlled Full-Duplex Speakerphone  
Using Automatic Gain Control**

**Abstract**

1           A near full duplex portable handset speakerphone comprises: a microprocessor; a hands-free  
2 receive register connected to the microprocessor; a hands-free transmit register connected to the  
3 microprocessor; a ROM having a speakerphone operation algorithm, the ROM connected to the  
4 microprocessor; a first analog-to-digital converter connected to the hands-free receive register; a second  
5 analog-to-digital converter connected to the hands-free transmit register; a first programmable digital  
6 attenuator connected to the microprocessor and to a speaker; and a second programmable digital  
7 attenuator connected to the microprocessor and to a microphone, wherein near full duplex  
8 communication is achieved without digital signal processing. In another feature of the invention, the  
9 hands-free registers provide a digital representation of the speech volume in each direction to the  
10 microprocessor. The microprocessor monitors the speech signal levels, calculates digital volume  
11 comparisons in order to make speech gain decisions for optimal sound, and digitally adjusts the gains  
12 in the two speech paths to the upper half of their maximum values.